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How Effective are HIV Behavior Change Interventions? Experimental Evidence from Zimbabwe

Anselm Rink^{a*} and Ramona Wong-Grünwald^b

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Abstract

There is growing evidence that HIV behaviour change interventions can increase knowledge, but have little effect on behaviour. We revisit this conclusion by evaluating a popular educational tool for teaching young people about HIV—the “Join-In Circuit on AIDS, Love, and Sexuality.” The tool has been implemented in over 20 countries, reaching out to more than 230,000 people. We present evidence from a randomized controlled trial in Zimbabwe that randomly assigned 3,661 individuals to the intervention. Using survey evidence, we find that the intervention increased knowledge both for assigned participants and nearby residents. While most behavioural outcomes are unaffected, individuals assigned to the JIC also report 0.5 fewer sex partners and are more likely to utilize social networks to talk about sexually transmitted infections. Problematically, the intervention also *decreased* confidence to practice safe sex. Using focus group discussions, we attribute the negative outcome to two unintended side effects. First, the intervention contradicted socio-cultural norms, creating uncertainty about correct behaviour. Second, by being exposed to information about the many risks of sexual intercourse, participants felt overwhelmed and less confident to practice safe sex.

Keywords: HIV; randomized controlled trial; behaviour change

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Introduction

Social, economic and biological factors make young people particularly vulnerable to HIV infection. Given the negative consequences of the HIV epidemic in Sub-Saharan Africa (Young, 2005; Bloom et al., 2012), governments and developmental agencies alike have focused their attention on educating the young on HIV and other sexually transmitted infections (STIs). A variety of behaviour change communication interventions have consequentially been implemented. The effectiveness of such interventions, however, continues to be debated (Dupas, 2011*a*; Nunnenkamp and Öhler, 2011; Chandra-Mouli, Lane, and Wong, 2015). A meta-analysis by Medley et al. (2009) finds that most studies report knowledge increases, but little behavioural changes.

This paper adds to the ongoing debate by experimentally evaluating a particularly large behaviour change intervention called the “Join-In Circuit on AIDS, Love, and Sexuality” (JIC). JIC, developed by the German Development Corporation (GIZ) in 2003, has been implemented in over 20 low- and middle-income countries. The intervention provides a peer-led interactive approach for communicating vital information about sexual reproductive health. By September 2015, about 230,000 individuals worldwide had participated in a JIC at least once (GIZ, 2015).

To assess the effectiveness of the JIC, we partnered with GIZ Zimbabwe to randomize the rollout of the JIC across 49 sites in Zimbabwe’s Manicaland province. Zimbabwe has been particularly affected by HIV, suffering from the world’s fifth-highest HIV adult prevalence rate at 16.7 percent (CIA, 2015). The intervention reached over 3,661 youth aged 15-24. Using a waitlist design, we randomly assigned the sites to two subsequent treatment phases. We conducted a

survey with 1,029 individuals—including individuals assigned to the JIC as well as a random neighbourhood sample—after the completion of phase 1 to estimate the effect of the intervention on knowledge, self-reported behaviour and confidence.

Our results show that the intervention had a positive effect on knowledge: Individuals assigned to the JIC score 10 percent higher on a comprehensive knowledge index as compared with attendants assigned to future JICs. Changes in behaviour, however, are modest. One noteworthy finding is a reduction in sexual partners by 0.5 among those assigned to the JIC. Problematically, we also document a negative effect of the JIC on confidence levels. Assigned individuals report being less confident in dealing with the challenges of STIs. Using focus group discussions, we attribute this finding to two unintended side-effects: JIC exposed individuals to knowledge at odds with traditional beliefs. Moreover, JIC provided information that made participants aware about the health risks of unprotected sex, leading some to prefer to ignore the topic altogether.

The remainder of the paper is organized as follows. Section 2 reviews related academic work and introduces the JIC. Section 3 introduces the data and methodology. Section 4 presents our statistical results as well as qualitative insights from focus group discussions. Section 5 summarizes the paper and highlights avenues for future research.

Background and Intervention

Related Literature

Our paper adds to an ongoing debate on the effects of educational interventions in increasing knowledge about STIs and sexual reproductive health, changing sexual

behaviour and increasing confidence to practice safer sex.

Policymakers and academics alike consider information a necessary condition for changing behaviour (Dupas, 2011*b*, 431). Educational interventions, particularly behaviour change communication (BCC) interventions, are widely seen as an effective way to increase knowledge. Indeed, most evaluations of BCC interventions demonstrate significant knowledge improvements among those assigned to attend. Harvey, Stuart, and Swan (2000) evaluated a high-school intervention in South Africa and show a strong increase in knowledge, particularly when the information is conveyed in an interactive manner. The intervention evaluated in this paper follows a similar interactive, “edutaining” approach. In Zimbabwe, an experimental evaluation of a BCC campaign by (Cowan et al., 2010) found modest improvements in knowledge and attitudes among young men and women. In contrast, some studies find no significant effects of BCC campaigns on knowledge. Among them is Kinsman et al. (2001) who evaluate a one-year school-based HIV education program in rural Uganda, detecting little to no improvements in knowledge about the disease. Overall, however, a meta-analysis of 11 educational programs concludes that “knowledge and attitudes are easiest to change” (Gallant and Maticka-Tyndale, 2004, 1337). Similarly, a meta-analysis by (Mavedzenge, Luecke, and Ross, 2014) finds that in-school interventions, which constitute half of the sample analysed in this study, are an efficient means to improve knowledge, attitudes, and skills. Our findings buttress this conclusion.

Positive effects of education interventions on behaviour, however, are less frequently reported. The absence of positive effects is part of a bigger puzzle, namely that the Sub-Saharan HIV epidemic has not been accompanied by significant behavioural changes. Oster (2005), for example, documents that the outbreak of HIV did not lead to a reduction in the share of women engaging in premarital sex across a

number of Sub-Saharan countries. Regarding BCC interventions, a meta-analysis by Bertrand et al. (2006) finds that 24 mass media interventions advocating safer sex practices had almost no effect on behaviour. Similarly, the already mentioned Cowan et al. (2010) study in Zimbabwe finds no impact of the BCC intervention on the prevalence of self-reported HIV. Conversely, a meta-analysis by Kirby, Laris, and Roller (2007), which focuses on curriculum-based HIV education programs, reports that two-thirds out of a sample of 83 programs significantly improved sexual behaviour. However, the already mentioned meta-analysis by Mavedzenge, Luecke, and Ross (2014) warns that few trials evaluated biological outcomes, while behavioural outcomes, such as HIV incidence, STI prevalence, or pregnancy rates, remained largely unaffected. Similarly, a systematic review and meta-analysis by Michielsen et al. (2010) finds that out of a set of 31 recent HIV prevention interventions positive changes in sexual behaviour were largely not detected. Recent evidence from a seven-year randomized controlled trial (RCT) in Kenya revealed similar evidence (Duflo, Dupas, and Kremer, 2015). The authors show that education subsidies, which increased participant exposure to the government's HIV curriculum, did not affect STI prevalence. In a similar vein, Oster (2012) demonstrates that residents in areas of Sub-Saharan Africa with higher knowledge of the HIV epidemic do not exhibit greater behaviour change. In the few studies where behavioural change is documented, effect sizes vary widely. For example, Thornton (2008), using an RCT in Malawi, finds that people merely increase their purchases of condoms by one when learning about an HIV infection. Dupas (2011a), using experimental evidence from Kenya, finds that providing information on the relative risks of HIV decreased teen pregnancy—a common proxy for the incidence of unprotected sex—by as much as 28 percent. A related literature has also assessed the effects of HIV testing. Delavande and Kohler (2012) find that that

individuals informed about their HIV-positive status report having fewer partners and using condoms more often than those not informed about their status. Similarly, Gong (2015) randomly assigns HIV testing across two sites in sub-Saharan Africa and finds that testing, when it provides unexpected information such as an HIV infection, increases risky sexual behaviour. Finally, Baird et al. (2014) investigate the effects of randomly assigning home based HIV testing and find no effects on HIV or achievement test scores. The authors do note, however, that individuals who tested positive for HIV witness an increase in HSV-2 infections. The present study confirms that sexual behaviour change is difficult to achieve as a result of a BCC intervention. We do, however, note that JIC led to two positive behavioural effects: namely, a sizable reduction in the number of sex partners by 0.5 and an increase in the number of people with whom individuals felt comfortable talking about STIs by 0.6. The latter finding is in line with studies highlighting the importance of social networks in fostering safer sex practices (Stoneburner and Low-Beer, 2004).

A final mechanism suggested by policymakers to change behaviour in response to the HIV epidemic has been the raising of confidence. Practitioners regard confidence as an attitudinal outcome well suited to predict future behaviour (GIZ, 2015). Thus far, however, few experimental evaluations have explicitly measured and reported effects of BCC interventions on confidence. One notable exception is by Belcher et al. (1998) who evaluate an educational sexual risk reduction intervention for women. The authors demonstrate that participants reported significantly higher levels of confidence to practice safer sex, which was a strong predictor of future condom usage. Our study expands on this finding by collecting a number of confidence related outcomes. However, we find that JIC *decreased* confidence. The two explanations why this effect occurred—conflicting norms and a feeling of being overwhelmed—demonstrate the

importance of adapting BCC interventions to local contexts. As Mavedzenge, Doyle, and Ross (2011, 585) note: “several factors may mediate behaviour change in young people, and the social, cultural, and epidemiologic contexts in which interventions are implemented may impact their effectiveness considerably.” The negative outcome thus highlights that even the most straightforward mechanism through which STI prevalence is supposedly reduced—the transmission of information—may be affected by the socio-cultural context in ways currently not sufficiently documented in the empirical literature (Wight et al., 2006). The focus group evidence thus adds to a qualitative literature on social and cultural factors in shaping people’s sexual behaviour (MacPhail and Campbell, 2001; Marston and King, 2006), providing evidence regarding the mechanisms that may undermine BCC interventions.

Intervention

In 2010, youth aged 15-24 accounted for 42 percent of new HIV infections worldwide, nearly 80 percent live in Sub-Saharan Africa. In Zimbabwe, HIV prevalence among youth is at 6 percent (ZNSA, 2012). About 50 percent of youth have comprehensive knowledge about HIV. Access to HIV testing and counselling, however, continues to be limited. Major obstacles to access are found in poor training among hospital staff including insufficient management of adolescent sexual reproductive health needs, socio-cultural and religious barriers, and structural barriers such as distance and transport costs to health facilities. At the same time, practitioners have lamented restricted sexual education in schools, and a lack of motivation from youth to participate in health related activities.

To tackle these challenges, GIZ has been implementing the “Join-In Circuit on HIV, Love & Sexuality” (JIC) in Zimbabwe since 2006 as part of a larger HIV prevention project¹. At the time, one-third of all new HIV infections in Zimbabwe

occurred among youth. Young women were twice as likely as young men to be infected with HIV. Today, while knowledge of HIV in Zimbabwe is nearly universal, only 52 percent of young women and 47 percent young men have comprehensive and correct knowledge about HIV transmission (ZNSA, 2012). The aim of JIC in Zimbabwe is therefore to raise awareness about adolescent sexual reproductive health including HIV prevention, to influence sexual behaviour and to increase confidence in safer sex practices.

Since its inception, JIC has been applied in all ten provinces of Zimbabwe, including the province studied in this paper². Since 2011, JIC has been linked to health services, including selected government district clinics and mobile services. After each JIC, participants can opt for mobile HIV testing and counselling (HTC) on site provided by mobile outreach teams from Population Services International. In 2015, the intervention was implemented in three districts in Manicaland Province, which are the focus of the present study.

JIC in Zimbabwe includes seven stations, which are described in Table 1. These stations are administered to participants once. JIC is implemented by trained educators that guide gender-balanced groups of ten through the stations. A maximum of 12 individuals per station are allowed, bringing the total to 84 individuals per JIC implementation. It lasts for about 1.5 hours.³

Table 1: JIC stations

| Station | Content |
|---|--|
| 1. Ways of HIV transmission | Common everyday-life activities are depicted through pictures and participants are asked to classify each activity by describing the HIV infection risk for each activity. Using color-coded cards to assess the risk for HIV transmission, the activities are discussed and classified. Myths and misconceptions relating to transmission and risk factors are dispelled. |
| 2. Contraception | Pictures of different types of contraceptives available in Zimbabwe are displayed on a board. Participants are asked to identify any contraceptive method they recognize and to talk about how it works to prevent pregnancy, its advantages, and disadvantages, and to what extent it protects against HIV. |
| 3. Condom use | Pictures of different types of contraceptives available in Zimbabwe are displayed on a board. Participants are asked to identify any contraceptive method they recognize and to talk about how it works to prevent pregnancy, its advantages, and disadvantages, and to what extent it protects against HIV. |
| 4. Sexually transmitted Infections (STIs) | A picture story of a young man, which demonstrates the risk of unprotected sex and symptoms of STI, is used to begin discussions around different types of STIs. The variety of signs and symptoms are discussed, how they manifest differently in men and women, and how they can be prevented. Myths and misconceptions on prevention methods are dispelled. |
| 5. Body language, love, sexuality and HIV | Participants volunteer to be shown a word or phrase, which they act without speaking. The word is written on the back of a jigsaw piece. The group is asked to guess the term being acted. Discussions on culturally sensitive issues around relationships and sexuality, such as caressing, breaking up and sexual harassment, are encouraged. |
| 6. Living with HIV | The station focuses on positive living for those infected with HIV, and how they can be supported by their families and communities. Pictures depicting various activities of “positive living” are shown. |
| 7. Protection station | A dice is used for discussions of the social and clinical aspects of HIV. One of the participants rolls the dice showing a symbol. Participants have to locate the envelope that contains the symbol. Inside the envelope are a set of HIV related questions that participants will discuss. The dice is rolled again and the cycle is repeated. |



Figure 1: Map of JIC sites

Design

We worked with GIZ to randomize the JIC implementation at the community level across 49 sites in three districts of Manicaland Province: Mutare Rural, Mutare Urban, and Buhera.⁴ Maps of the three districts and corresponding JIC sites are provided in Figure 1. 27 of the localities were assigned to receive JIC outside of schools; in the remaining 22 localities, JIC were conducted inside schools.⁵

Within the 49 localities, 24 were assigned to the first phase (treatment phase), the remaining 25 were assigned to the second phase (control phase). We used block randomization to minimize treatment and control group imbalances by arranging sites into blocks that are similar to one another. In particular, we blocked on the following locality-level characteristics: whether the locality had received a JIC run in the past

(*Prior JIC*), how often a JIC run had been implemented in the past (*Prior JIC Incidence*), whether the locality received an in-school or out-of-school JIC (*In-School*), the implementing NGO (*Implementor*), whether interventions by other developmental actors in the locality had been implemented in the past (*Complementary Intervention*), as well as the district (*District*).⁶ The full list of locality variables is given in Appendix Table 9. Sites assigned to the first phase received the intervention between January and May 2015, while sites assigned to the second phase received the intervention between July and September 2015.

Sampling Procedure

After implementing JIC in all treatment sites, a survey was conducted to assess the impact of the intervention. The survey was conducted between June and July 2015 at all 49 JIC sites by a local survey firm (*New Dimension Consulting*) in the local Shona language.⁷ Surveying activities started in the sites assigned to phase 2 (control) before moving into sites assigned to phase 1 (treatment). This was done to give treated participants sufficient time to change their behavior in accordance with the intervention. In each locality, 21 individuals were sampled, resulting in an overall sample of 1,029.

At each JIC site, two distinct samples of youth (aged 15-24) were drawn. First, the survey firm randomly selected five youth at the household level based on a random walk procedure (*Neighborhood sample*) within a 3km radius of JIC sites.⁸ The sample was drawn to assess general equilibrium effects of JIC. Second, at each site the implementing NGOs mobilized all individuals that had originally been assigned to participate in JIC—either in phase 1 or 2—of which the survey firm randomly sampled 16 individuals (*Assigned sample*). The sample was drawn to assess the effect of JIC on those assigned to attend alone.

Even though there were no problems in recruiting individuals to take part in the survey, 32 participants failed to complete the questionnaire and were therefore removed from the analysis.

Table 2: Self-reported participation in JIC across Assigned and Neighbourhood samples

| | Assigned sample | | Neighborhood sample | |
|--------------------|------------------------|-------------|----------------------------|-------------|
| | Control | Treatment | Control | Treatment |
| Attended JIC | 2 | 285 | 0 | 12 |
| % | <i>0.5</i> | <i>75.2</i> | <i>0.0</i> | <i>9.9</i> |
| Did not attend JIC | 377 | 94 | 118 | 109 |
| % | <i>99.5</i> | <i>24.8</i> | <i>100.0</i> | <i>90.1</i> |
| Total | 379 | 379 | 118 | 121 |

In Table 2, we plot assignment to treatment, and self-reported participation in the intervention across the Neighbourhood and Assigned samples. Three pieces of information merit discussion. First, there is no evidence of selection into treatment. Only two people at control sites report having participated in JIC.

Second, within the Assigned sample at treated sites, 75 percent of the mobilized youth report having attended JIC. The relatively high number of non-attendance is due to the fact that the implementing NGOs were not in the position to cross-check whether mobilized youths (individuals originally assigned to JIC and willing to participate in a lottery to be surveyed) had in fact been assigned. In particular, the NGO mobilized youths several days ahead of the arrival of the survey firm, inviting them to come to the JIC site for the opportunity to participate in a survey. The individuals that showed up could not be validated as originally assigned youths as identification cards are not frequently carried by teenagers. Moreover, the fact that individuals were compensated

for their participation in the survey (3 USD) may have presented an incentive for some to falsely claim to have been assigned to JIC.⁹ While the NGOs took any effort to avoid such cheating, it is likely the reason that the Assigned sample includes 25 percent non-attendees. If anything, however, this likely dampens any treatment effects.

Third, within the random Neighbourhood sample, 10 percent of sampled individuals report having attended a JIC run. Given that approximately 80 individuals were treated at each site, this number implies 800 youth within 3km of each site—a number qualitatively confirmed by program administrators.

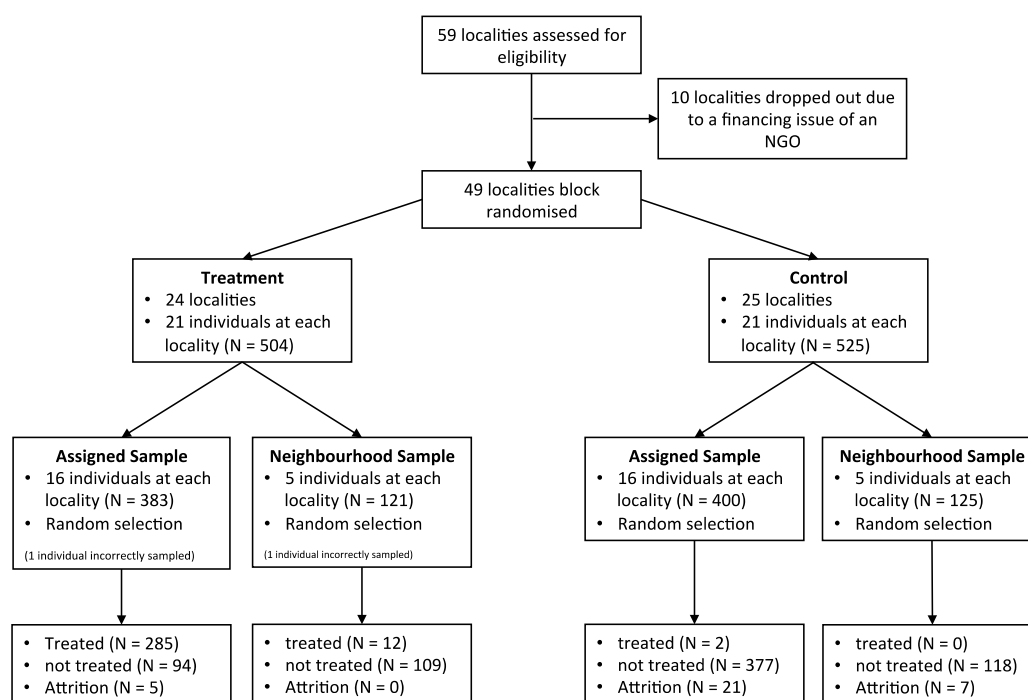


Figure 2: Randomization flow diagram

Descriptive Statistics and Balance

Appendix Table 7 provides descriptive statistics of the random Neighborhood sample.

The first column reports the variable, the second the minimum (*Min*) value and the third

the maximum (*Max*) value for a given variable. For each variable, we provide the sample size (*N*), the mean (*Mean*) and the standard deviation (*SD*). Columns 4-6 report all sites, columns 7-9 treatment sites, and columns 10-12 control sites. In the final two columns, we report p-values resulting from *t*-tests assessing whether means are significantly different across treatment and control sites, and p-values resulting from *F*-tests, testing whether variances of the distributions across treatment and control sites are significantly different. In Appendix Table 8, we report the same descriptive statistics for the Assigned sample, which includes individuals that participated in a JIC run in phase 1, and individuals assigned to participate in phase 2. The survey items used to construct these variables are given in the Appendix.

For both samples, we report respondents' age (*Age*), sex (*Female*), education level on a scale from 1 to 5 (1 refers to no education, 5 to college-level education; *Education scale*), unemployment level (*Unemployed*), educational enrollment (*Student (School)*, *Student (College)*), self-employment level (*Self-Employed*), religion (*Catholic*, *Apostolic*, *Christian unspecified*), income per week in USD (*Income*) and whether respondents report no income (*No Income*).

In addition, we report variables regarding respondents' relationship status (*Single*, *Relationship*, *Married*) as well as three variables relating to health status prior to the intervention: whether respondents had been tested for HIV before JIC (*HIV Test*), whether the result is known (*Result Known*) and whether respondents report to have had sexual intercourse prior to JIC (*Sex before JIC*). Reporting on these additional variables, however, may have been affected by the treatment.¹⁰ That is, attending the JIC may have changed individuals relationship status and, also, reporting behavior about health prior to the intervention. We, therefore, label these variables "possibly affected by treatment."

Overall, the Neighborhood sample is well-balanced when focusing on pre-treatment covariates. Variables possibly affected by treatment, however, showcase differences across treatment and control, with three variables yielding significant differences in means. The Assigned sample, however, reflects imbalances that are unusual for a randomized controlled trial. 10 variables have statistically significant differences in means—which includes variables that are pre-treatment. Differences in the variances of the variables are less pronounced. Qualitative reports from the field underline that the partners successfully randomized the selection of respondents that either attended or were to attend JIC. Moreover, the NGOs—which have been working in the communities for many years—stated that the mobilization of past and future assigned individuals worked according to plan—besides the issue of non-assigned individuals passing as assigned, which was discussed before.

Aside from sampling variability, one likely source of bias highlighted by the survey firm is the timing of the survey. As was discussed, the survey firm interviewed individuals at control sites (phase 2) first, and later followed with individuals at treatment sites (phase 1). Because of delayed ethical clearance, surveying at treatment sites coincided with the O-level exams period and school/college holidays. This may explain why respondents in the Assigned sample at treated sites are more likely to be in school, younger, less likely to be unemployed and less likely to be in a relationship: school holidays gave individuals at treated sites who are still attending school an incentive to enter the surveying lottery.¹¹ In Table 10 of the Appendix, we report the Assigned sample without enrolled students. When excluding students, covariate balance is largely restored (four variables yield differences in means across treatment and control sites with p-values below 0.05). This underlines that the timing of the survey is the likely cause for the observed imbalance in the aggregate Assigned sample.

In Table 3, we further delve into possible repercussions of the imbalance in the Assigned sample by regressing the individual-level covariates on the treatment indicator across the Neighborhood and Assigned samples, clustering standard errors at the site-level. When excluding the individual-level control variables possibly affected by the treatment (models 1 and 2), we find virtually no significant predictors of assignment to treatment. When including these variables (models 3 and 4) we find these variables to significantly predict treatment. Taken together, these results show that pre-treatment imbalance is less of a concern when analyzed jointly, particularly when excluding the variables possibly affected by the treatment.

Measurement

The survey instrument, which is available in the Appendix, included 56 questions. To counter concerns of “p-hacking” (White, 2000), we analyze and discuss all instruments in this paper and generate indexes for the three broad outcomes of interest. The survey included three main sections. The first section focused on *knowledge* regarding family planning (FP), condoms, HIV/AIDS, and other STIs. The second section inquired about *behavior* regarding HIV testing, the use of health facilities and youth-friendly corners at health facilities, and sexual behavior. The third section, inquired about a subset of self-reported behavior, namely, community effects of JIC, including the spillover of information across local networks. Each section included a distinct set of questions on *confidence* regarding, i.a., the use of contraception and health services available to prevent and treat HIV infection. The exact instruments are discussed in Section 3.

Table 3: Regression of Treatment Status on Pre-Treatment Covariates

| | Outcome: Treatment Status | | | |
|---------------------------------------|---------------------------|--------------------|-----------------------|----------------------|
| | Neighborhood (1) | Assigned (2) | Neighborhood (3) | Assigned (4) |
| Age | -0.058 (0.071) | 0.009 (0.061) | -0.022 (0.083) | -0.008 (0.062) |
| Female | 0.451 (0.263) | -0.007 (0.083) | 0.096 (0.344) | -0.004 (0.103) |
| Education | 0.177 (0.327) | 0.074 (0.318) | 0.029 (0.386) | 0.132 (0.291) |
| Unemployed | -0.010 (0.699) | -0.333 (0.594) | 0.297 (0.736) | -0.249 (0.598) |
| Student (school) | -1.986 (1.176) | -0.066 (1.010) | -1.949 (1.489) | 0.108 (1.014) |
| Student (college) | 0.027 (0.728) | 0.320 (0.696) | 0.287 (0.733) | 0.279 (0.705) |
| Self-employed | 0.074 (0.622) | 0.747 (0.416) | -0.075 (0.652) | 0.842 (0.436) |
| Catholic | 0.126 (1.536) | 0.185 (0.726) | 0.660 (1.375) | 0.359 (0.781) |
| Apostolic | -0.071 (1.209) | 0.312 (0.590) | 0.385 (1.067) | 0.428 (0.654) |
| Christian unspecified | 0.570 (1.182) | 0.534 (0.616) | 1.197 (1.023) | 0.695 (0.669) |
| Income | -0.001 (0.002) | -0.001 (0.003) | -0.002 (0.002) | -0.001 (0.004) |
| No income | -0.329 (0.689) | 1.478** (0.459) | -0.515 (0.644) | 1.387** (0.469) |
| <i>Possibly affected by treatment</i> | | | | |
| Single | | | -16.050*** (0.911) | 0.130 (0.728) |
| Relationship | | | -16.613*** (0.918) | -0.606 (0.769) |
| Married | | | -15.024*** (0.891) | -0.375 (0.644) |
| HIV test before JIC | | | -0.548 (0.327) | -0.772*** (0.229) |
| Result known before JIC | | | -0.394 (0.429) | 0.338 (0.263) |
| Had sex before JIC | | | -1.205* (0.487) | 0.143 (0.340) |
| N | 238 | 758 | 238 | 758 |

Notes: Logistic regressions with cluster-robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Estimation

To estimate the impact of JIC on knowledge, self-reported behavior and confidence, we estimate reduced form regressions. In particular, our empirical strategy compares respondents at treatment to respondents at control sites. The primary ordinary least squares (OLS) regression specification is as follows:

$$Y_{il} = \beta_0 + \beta_1 \text{TREAT}_{il} + \beta_2 \mathbf{X}_{il} + \epsilon_{il}$$

where Y_{il} represents the outcome of individual i in locality l , TREAT represents a dummy indicator whether the community was treated and \mathbf{X}_{il} represents a vector of 18 individual-level and 14 community-level control variables, which are listed in Appendix Tables 7 - 9. All models cluster standard errors at the locality-level. In line with (Freedman, 2008), we do not estimate logistic regressions for binary outcomes, but fit linear probability models using OLS. For each outcome, we estimate separate regressions for the Assigned and Neighborhood samples. For ease of interpretation, we report OLS estimates when estimating the effect of the treatment on the number of sex partners in the last 12 months. We confirm the robustness of this finding using poisson and negative binomial regressions in Table 18 in the Appendix.

Our decision to control for all available covariates was as follows. First, all individual-level variables constitute standard items in the health interventions literature—i.e., age, gender, education, income, prior health status, relationship—and are commonly argued to be predictive of health outcomes. Second, we include all available variables in order to circumvent concerns arising from “data fishing” (Humphreys, Sierra, and Van der Windt, 2013), where researchers decide to exclude variables from their analyses post-hoc. Third, to alleviate concerns that some individual-level variables were affected by the treatment (notably, relationship status and prior

health outcomes), we present robustness models in the Appendix to demonstrate that estimates are virtually unchanged when excluding these variables.

Results

Knowledge

In Table 4, we report the effect of JIC on knowledge. In all 15 models, we regress the indicated survey outcome on a treatment indicator as well as 18 individual-level and 14 locality-level control variables. To save space, we only report estimates for the treatment, female and age dummies, given that these are particularly salient for policy-makers. As can be seen, JIC had an unequivocally positive effect on knowledge.

Regarding **family planning** (models 1-3), we estimate that assigned individuals are 18 percent more likely to have heard of FP, and know 1.1 more FP methods than future assigned individuals at phase 2 sites. Both effects are larger for women and older individuals. While not statistically significant, the effects are confirmed in the Neighborhood sample. The number of sources where assigned individuals can get contraceptives, however, yields no statistically distinguishable effect and takes a negative sign in the Neighborhood sample.

Regarding **condoms** (models 4-6), we document that assigned individuals are 8 percent more likely to have heard of condoms, know 0.2 more condom advantages and are, on average and on a 1-4 scale (measured using a 4 point knowledge scale ranging from very knowable to not knowledgeable) 0.5 points more in agreement with the statement that they know how to correctly use a condom as compared with future assigned attendants. The effects largely translate into the Neighborhood sample, though at lower levels of statistical significance and smaller effect sizes. Aside from women being less confident in using female condoms, there are no differential effects across

age brackets and gender.

Regarding **STIs** (models 7-10), our models show that assigned individuals are 17 percent more likely to have heard of STIs, can list, on average, 0.7 more STIs, know 0.7 more STI symptoms, and can name 0.2 more help sources to get STIs treated than future assigned individuals. The effect sizes, however, are significantly smaller in the Neighborhood sample and not statistically significant, though all effect sizes continue to be positive. Older respondents score significantly better on all four measures, while women do not score differently than men—aside from the fact that they can name slightly fewer STI symptoms.

Regarding **HIV** (models 11-15), we find that assigned individuals know 0.4 more ways of transmission, and know 0.4 more ways to prevent HIV as compared with future assigned individuals. There is, however, no discernible difference regarding the knowledge of HIV as well as points where to get tested—likely because this knowledge is near-universal. Somewhat worryingly, assigned individuals are less likely to report being at risk of HIV (-2 percent), but the difference is not significant. The size and direction of the estimates reported are confirmed in the Neighborhood sample, but few estimates are statistically significant. Overall, in the Assigned sample older individuals score slightly higher on the HIV outcomes, while in the Neighborhood sample women score slightly lower than men.

In the final column, we create a comprehensive index of all 15 knowledge outcomes. In particular, the index standardizes all 15 measures and averages them to an index, which ranges from 0 to 3.3. The index, which also ameliorates the danger of multiple comparisons bias, buttresses the finding that JIC had an overall positive impact on knowledge both in the Assigned and in the Neighborhood sample. Assigned individuals score 0.3 points more on the index, while the respondents in the

Neighborhood sample score 0.1 points more (though this effect is only significant at the 10 percent level). In the Assigned sample, older individuals score higher than younger youth, while there is no such effect for women. On the contrary, in the Neighborhood sample, women score significantly lower than men (-0.2 points), while older individuals exert no difference.

Behaviour

Next, we turn to self-reported behavior toward family planning, condoms, multiple concurrent partnerships, HIV and access of HTC, and social networks. In Table 5, we report 13 measures of self-reported behavior. All models regress the indicated survey outcome using the same specification as before, again reporting the Female and Age dummy. Overall, the intervention had ambivalent effects on behavior with few statistically significant results.

Regarding **family planning** (models 1-3), there are no discernible differences across past and future assigned individuals when it comes to visiting health facilities and youth-friendly corners, as well as the utilization of FP. Relevant FP methods included oral contraceptives (pill), male and female condom, IUD (loop), injectables (Depo-Provera) and implants (Jadelle). The estimates, again, are comparable across the Assigned and Neighbourhood samples. In addition, answers do not differ across age cohorts and gender. Regarding **condoms** (models 4-5), we find no significant effects for assigned individuals as compared with future assigned individuals. Note that this outcome is necessarily restricted to individuals that have had sex, which represents about 30 percent of the sample. Assigned individuals are 3 percent less likely to have used a condom last time during sex, while there is no effect on whether condoms are used consistently. Both estimates, however, are not significant. In the Neighbourhood sample, the negative effect sizes are slightly larger, but not statistically significant.

Table 4: Effect of JIC on knowledge

| | Family Planning (FP) | | | Condoms | | | | Sexually Transmitted Infections (STIs) | | | | HIV | | | Index (16) | |
|----------------------------|-----------------------|--|---|----------------------------|---|--------------------------------|----------------------|--|--|--|----------------------|--|---|--|--------------------|---------------------------------|
| | (1) Heard about FP | (2) Number of FP methods respondent knows | (3) Number of sources to get contraceptives respondent knows | (4) Heard about condoms | (5) Number of condom advantages respondent knows | (6) Knows how to use condom | (7) Heard of STIs | (8) Number of STIs respondent knows | (9) Number of STI symptoms respondent knows | (10) Number of help sources for STIs respondent knows | (11) Heard of HIV | (12) Number of transmission ways respondent knows | (13) Number of avoidance mechanisms respondent knows | (14) Respondent knows where to get tested | | (15) Perceived to be at risk |
| Range: | 0-1 | 1-11 | 1-7 | 0-1 | 1-9 | 1-4 | 0-1 | 1-11 | 1-7 | 1-10 | 0-1 | 1-6 | 1-6 | 0-1 | 0-1 | 0-3 |
| Assigned Sample | | | | | | | | | | | | | | | | |
| Treatment | 0.180*** (0.041) | 1.059*** (0.212) | 0.087 (0.073) | 0.079** (0.026) | 0.174* (0.072) | 0.491*** (0.068) | 0.167*** (0.043) | 0.741*** (0.251) | 0.735*** (0.190) | 0.160** (0.056) | 0.001 (0.013) | 0.388*** (0.100) | 0.384** (0.113) | 0.016 (0.017) | -0.018 (0.032) | 0.301*** (0.070) |
| Above 19 | 0.060* (0.029) | 0.800*** (0.157) | 0.303*** (0.072) | -0.008 (0.026) | 0.105 (0.084) | -0.014 (0.092) | 0.111** (0.039) | 0.530* (0.200) | 0.459** (0.143) | 0.198** (0.059) | 0.007 (0.010) | 0.206* (0.086) | 0.214* (0.102) | 0.031† (0.017) | 0.022 (0.038) | 0.194*** (0.048) |
| Female | 0.040† (0.021) | 0.622*** (0.141) | 0.023 (0.059) | -0.036 (0.023) | -0.102 (0.061) | -0.783*** (0.077) | -0.042 (0.028) | -0.234 (0.189) | -0.231* (0.111) | -0.047 (0.048) | 0.009 (0.010) | 0.083 (0.063) | -0.061 (0.084) | 0.010 (0.020) | -0.053 (0.035) | -0.068 (0.042) |
| N | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 |
| Neighborhood sample | | | | | | | | | | | | | | | | |
| Treatment | 0.030 (0.052) | 0.407 (0.261) | -0.151 (0.108) | 0.073† (0.038) | 0.194* (0.077) | 0.165 (0.127) | 0.042 (0.054) | 0.013 (0.279) | 0.386† (0.213) | 0.057 (0.065) | 0.047† (0.027) | 0.217† (0.126) | 0.225 (0.138) | 0.060* (0.025) | -0.078† (0.044) | 0.139* (0.068) |
| Above 19 | 0.083 (0.072) | 0.744* (0.317) | 0.165 (0.126) | 0.041 (0.043) | 0.120 (0.111) | -0.076 (0.159) | 0.040 (0.059) | 0.193 (0.327) | 0.060 (0.247) | 0.016 (0.081) | 0.036 (0.027) | 0.069 (0.143) | 0.196 (0.203) | 0.009 (0.027) | -0.073 (0.060) | 0.111 (0.088) |
| Female | 0.011 (0.056) | 0.417 (0.309) | -0.019 (0.127) | -0.147*** (0.039) | -0.209 (0.138) | -0.990*** (0.115) | -0.099 (0.065) | -0.236 (0.308) | -0.184 (0.302) | -0.073 (0.074) | -0.077* (0.030) | -0.373* (0.145) | -0.416** (0.141) | -0.051 (0.037) | -0.087 (0.053) | -0.261** (0.086) |
| N | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 |

Robust SEs clustered at the site-level in parentheses. † p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. In addition to reported covariates, models include all individual- and community-level control variables listed in Table 7 – 10.

Assigned sample, however, are significantly less likely to have used or consistently use female condoms as compared to men. This effect size is similar in the Neighbourhood sample, though not significant.

Regarding **multiple concurrent partnerships** (models 6-8), there are inconclusive effects for treated individuals. Assigned individuals, on average, report 0.5 fewer sex partners than future assigned individuals. The effect is 0.2 in the Neighbourhood sample, but not statistically significant. There is also weak evidence that individuals at treated sites are more likely to have a steady partner (14 percent in the Neighbourhood sample and 6 percent in the Assigned sample). Differences across men and women, and younger and older respondents yield no clear pattern.

Regarding **HIV and access of HTC** (models 9-10), we find no discernible differences across treated and untreated sites in both the Neighbourhood and Assigned sample. Effect sizes are estimated close to 0 and no differences exist across the reported covariates. The null finding is somewhat surprising in light of observational evaluations by GIZ that consistently reported positive effects (GIZ, 2015).

Finally, we assess the effect of JIC on individual **networks** (models 11-12). Here, we find that assigned individuals—while not having more friends to talk about personal problems in general—are more likely to list specific people with whom they could talk about HIV/AIDS and other STIs. In the Assigned sample the figure is 0.6 persons higher, while in the Neighbourhood sample it is 0.2 persons higher (the latter estimate is not statistically significant). This finding underlines the positive effect of JIC on community-level networks to discuss sexual matters. The increase in one's social network is more pronounced among men than among women, as well as larger among older than among younger individuals—though estimates vary across both samples and

are not always significant.

To counter multiple comparison concerns, we furthermore assess the overall effect of JIC on behaviour by creating two indexes. The first index standardizes six outcome measures that are not contingent on having had sex, which includes the outcomes used in models 1, 2, 6, 9, 11, and 12, averages them and combines them to an index (*Index w/o sex*; range from 0-1). Note that the index re-codes all variables such that a treatment effect refers to a positive outcome, e.g., the decrease in the number of sexual partners. The estimates (model 13) showcase that there is no statistically significant effect on behaviour in either the Assigned or Neighbourhood sample.

The second index uses the same six outcome measures and adds the remaining outcomes that pertain to individuals who have had sex. Here, we exclude the variable indicating whether an individual knows their test result as it reduces the sample size by 300. Similarly, the index standardizes all outcome measures and averages them (*Index w/ sex*, range from 0-1). We find a slight negative effect on behaviour in the Assigned sample (negative 0.1 points), though the effect does not translate into the Neighbourhood sample. Younger and female respondents score lower on both indexes, but the results are not consistently significant. Overall, the results thus underline that JIC had few discernible effects on behaviour.

Table 5: Effect of JIC on behavior

| | Family Planning | | | Condoms | | Multiple Concurrent Partnerships | | | HIV and access of HTC | | Network Effects | | Index w/o sex | Index w/ sex |
|----------------------------|-------------------|--------------------------------|-------------------|--------------------------------|--------------------|----------------------------------|---------------------|--------------------|-----------------------|-------------------|-------------------------------|---------------------|--------------------------------|--------------------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) |
| Range: | 0-1 | 0-1 | 0-1 | 0-1 | 0-1 | 0-1 | 1-15 | 0-1 | 0-1 | 0-1 | 0-100 | 0-100 | 0-1 | 0-1 |
| Assigned Sample | | | | | | | | | | | | | | |
| Treatment | 0.001 (0.039) | 0.027 (0.034) | 0.058 (0.066) | -0.025 (0.079) | 0.000 (0.065) | -0.024 (0.020) | -0.487** (0.152) | 0.056 (0.053) | 0.024 (0.018) | -0.009 (0.014) | 0.178 (0.232) | 0.599*** (0.143) | 0.102** (0.037) | 0.092 [†] (0.054) |
| Above 19 | -0.010 (0.035) | -0.036 (0.026) | 0.041 (0.088) | -0.122 (0.073) | -0.124 (0.093) | -0.028 (0.028) | 0.390 (0.284) | 0.093 (0.090) | 0.005 (0.015) | 0.020 (0.013) | 0.348 [†] (0.205) | 0.352* (0.149) | 0.036 (0.032) | -0.029 (0.051) |
| Female | 0.004 (0.029) | -0.039 [†] (0.021) | -0.052 (0.083) | -0.283** (0.099) | -0.212* (0.096) | -0.091*** (0.022) | -0.221 (0.172) | 0.078 (0.083) | 0.012 (0.014) | 0.011 (0.014) | 0.011 (0.286) | -0.136 (0.138) | 0.006 (0.027) | -0.091 [†] (0.045) |
| N | 758 | 758 | 204 | 204 | 204 | 758 | 204 | 204 | 758 | 478 | 755 | 758 | 755 | 204 |
| Neighborhood Sample | | | | | | | | | | | | | | |
| Treatment | -0.002 (0.053) | 0.025 (0.031) | -0.137 (0.125) | -0.102 (0.100) | -0.121 (0.073) | 0.010 (0.044) | -0.139 (0.287) | 0.142* (0.053) | 0.031 (0.023) | -0.010 (0.010) | 0.189 (0.301) | 0.239 (0.195) | 0.052 (0.040) | -0.048 (0.058) |
| Above 19 | -0.082 (0.057) | 0.014 (0.041) | -0.002 (0.168) | -0.074 (0.109) | 0.047 (0.123) | -0.008 (0.052) | -0.272 (0.478) | 0.243** (0.089) | 0.008 (0.041) | -0.018 (0.015) | 0.272 (0.393) | -0.061 (0.247) | -0.018 (0.057) | 0.061 (0.075) |
| Female | -0.038 (0.054) | -0.004 (0.043) | -0.038 (0.151) | -0.210 [†] (0.115) | -0.118 (0.117) | -0.045 (0.040) | -0.265 (0.204) | 0.033 (0.066) | 0.021 (0.033) | 0.039 (0.035) | -0.586 (0.408) | -0.619* (0.265) | -0.098 [†] (0.055) | -0.028 (0.066) |
| N | 238 | 238 | 104 | 104 | 104 | 238 | 104 | 104 | 238 | 141 | 237 | 238 | 237 | 104 |

Robust SEs clustered at the site-level in parentheses. [†] p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. In addition to reported covariates, models include all individual- and community-level control variables listed in Table 7 – 10.

Confidence

Finally, we turn to the effect of JIC on confidence. In Table 8, we report five measures of confidence regarding FP, condoms, and STIs. Again, all models regress the indicated survey outcome on a treatment indicator as well as 18 individual-level and 14 locality-level control variables, clustering standard errors at the locality-level. Surprisingly, JIC had *negative* effects on self-reported confidence levels. All outcomes are measured using a 5 point confidence scale, which ranges from not confident at all (1) to very confident (5).

Regarding **family planning** (model 1), assigned individuals are, on average, 0.2 points less likely to visit a health facility than future assigned individuals. The effect size is the same in the Neighborhood sample, though both estimates are not statistically significant. Aside from a positive effect for women in the Neighborhood sample, there are no differences across young and old respondents as well as men and women.

Regarding **condoms** (model 2-3), we find that assigned individuals are 0.5 points less confident to insist on a condom during sex (male and female condoms, respectively). Similarly, assigned individuals are 0.4 points less confident to refuse sex in case a condom is not used. The estimates are negative in the Neighborhood sample as well—though smaller in size and not statistically significant. In the Neighborhood sample, women display significantly higher confidence than men.

Regarding **STIs** (model 4-5), assigned individuals are not less confident to get an STI screening at a nearby health facility. Problematically, however, treated individuals are 0.2 points less confident to tell their partner about a possible STI infection. The negative finding persists in the Neighborhood sample, but is less pronounced among women as compared to men. No difference between younger and older respondents is apparent.

In the final column (model 6), we create a similar comprehensive index of all confidence outcomes, which standardizes the five measures and averages them to an index. The index ranges from 0 to 5. Again, the index supports the finding that JIC had a detrimental effect on confidence: In the Assigned sample, the reduction is 0.3 points, while in the Neighbourhood sample it is 0.2 points. Both estimates are significant, the latter only at the 10 percent level. Confidence seems to be lower among older respondents (significant only in the Assigned sample) and higher for women in the Neighbourhood sample.

Focus Group Discussions

To elaborate on the unforeseen negative effect of JIC on confidence, 12 sex- and age-dis-aggregated Focus Group Discussions (FGDs) were conducted by a local survey firm (*M-Consulting Group*). They took place in September 2015, relying on a non-random purposive sample of 97 youth who had participated in the survey in June/July 2015. Each FGD had 6-12 participants and was conducted in the local Shona language. Facilitators were of the same sex as the groups in order to provide participants with the platform to discuss sexual behavioral and social issues comfortably. The FGDs aimed to capture JIC participants' views on, and understanding of JIC's content with regard to selected sexual behaviors. Each participant received a 3 USD token of appreciation. Aside from nuanced programming advice, the discussions yielded two salient pieces of evidence, which help explain the negative treatment effect on confidence.¹²

First, respondents pointed researchers to a *confusion* effect. The information provided by JIC made some participants wary of the right behavior. FGD participants identified a wide range of socio-cultural and religious barriers to accessing health

Table 6: Effect of JIC on confidence

| | Family Planning (FP) | Condoms | | Sexually Transmitted Infections (STIs) | | Index |
|----------------------------|----------------------------------|-------------------------------|--|---|-------------------------------------|--------------------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Confident to visit health clinic | Confident to insist on condom | Confident to refuse sex if no condom is used | Confident to get STI screening at health facility | Confident to tell partner about STI | |
| Range: | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 |
| Assigned Sample | | | | | | |
| Treatment | -0.224 (0.149) | -0.519** (0.151) | -0.395** (0.115) | -0.041 (0.081) | -0.232* (0.101) | -0.199*** (0.053) |
| Above 19 | -0.283 [†] (0.161) | -0.125 (0.118) | -0.041 (0.119) | -0.079 (0.099) | -0.282 [†] (0.140) | -0.116* (0.057) |
| Female | 0.124 (0.166) | 0.093 (0.138) | -0.226* (0.091) | 0.091 (0.079) | -0.676*** (0.115) | -0.085 (0.055) |
| N | 758 | 758 | 758 | 758 | 758 | 758 |
| Neighborhood Sample | | | | | | |
| Treatment | -0.230 (0.201) | -0.055 (0.250) | -0.172 (0.158) | -0.201 (0.153) | -0.433* (0.186) | -0.168 [†] (0.086) |
| Above 19 | -0.064 (0.225) | -0.011 (0.271) | 0.333 [†] (0.180) | -0.207 (0.130) | -0.169 (0.199) | -0.026 (0.088) |
| Female | 0.474* (0.214) | 0.825*** (0.198) | 0.668** (0.200) | -0.013 (0.128) | -0.430* (0.165) | 0.207** (0.070) |
| N | 238 | 238 | 238 | 238 | 238 | 238 |

Robust SEs clustered at the site-level in parentheses. [†] p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. In addition to reported covariates, models include all individual- and community-level control variables listed in Table 7 – 10.

facilities and utilizing health services. In particular, respondents highlighted a widespread view that family planning is for individuals in marriage or union, and not for young unmarried individuals who do not yet have children. Participants claimed that young women or girls not in marriage are openly discouraged from using family planning services. Being seen at a health facility seeking family planning services, as is encouraged by JIC, is deemed socially unacceptable. In addition, participants pointed out that religious doctrines regarding family planning and utilization of modern health

services impose restrictions on believers' use of these services.¹³ Religions such as the Apostolic Church are known to encourage abstinence to avoid unplanned pregnancies and the use of holy water as part of healing (treatment) at the expense of modern family planning and health service endorsed by JIC. Notably, the Apostolic church—which 42 percent of all respondents in the aggregate sample belong to—is opposed to most modern family planning methods, including pills, and male and female condoms, and encourages traditional methods such as withdrawal. Violations of church doctrine, including the utilization of modern health-care services, attract sanctions, which include confession and public shaming. The socio-cultural and religious norms thus stand in sharp contrast to the information provided in the intervention. JIC encourages men and women to utilize a wide array of family planning methods, and provides this information to married as well as unmarried participants to protect against both STIs, including HIV, and pregnancy. The divergent pieces of information therefore created a conflict among some FGD participants, which undermined their confidence in accessing information and services, particularly among unmarried and sexually inactive youth.

Second, the FGDs highlighted that JIC exposed participants to unsettling information regarding HIV and other STIs, leading to an *ignorance* effect whereby participants avoid the topic altogether. Participants stated that the repercussions of STIs including HIV highlighted by JIC made them less likely to disclose or even test for a possible infection because their partners might adversely react, risking rejection, break-up or divorce. Moreover, respondents stated that partners might involuntarily disclose a possible STI infection to others, leading to public shame. The increase in knowledge about STIs, therefore, led individuals to prefer uncertainty and secrecy regarding their STI status due to densely knit social relationships and the corresponding fear of stigma and discrimination.¹⁴¹⁵

Finally, a number of female participants expressed concerns regarding STI screenings—including vaginal examinations—stating that it made them uncomfortable. In sum, then, given the individual and group-level repercussions of STI testing and a possible disclosure, several respondents preferred ignoring the topic and to remain uncertain about their health status.

Conclusion

This paper presents findings from an experimental evaluation of a large HIV education intervention, called the “Join-In Circuit on AIDS, Love, and Sexuality” (JIC). The RCT randomly exposed 3,661 individuals across 49 sites in Zimbabwe’s Manicaland province to the intervention. Using survey evidence among 1,029 respondents—drawn from a random sample of individuals assigned to the intervention, and a random sample of residents aged 15-24 within a 3km radius of the site—we find mixed evidence regarding the effectiveness of the HIV prevention tool.

First, the intervention had a positive effect on knowledge. Individuals at treated sites are significantly more likely to know about HIV, other STIs, family planning and condoms. On a comprehensive index of fifteen knowledge items, past assigned attendants score 10 percent higher than future assigned attendants, while nearby residents at treated sites score 3 percent higher than residents at in future treatment sites. Second, there are few discernible effects on self-reported behaviour. Differences regarding the visiting of health facilities and youth-friendly corners, the use of condoms, and the uptake of HIV testing are nearly absent. However, past assigned individuals report 0.5 fewer sex partners in the last 12 months than future assigned individuals. The finding may be an artefact of social desirability bias. Still, it represents a stark reduction for a key outcome of interest for BCC campaigns. Moreover, the

survey uncovers a network effect, namely, that past assigned individuals report 0.6 more individuals with whom they feel comfortable talking about HIV and other STIs. Notwithstanding, indexes of all self-reported behaviour items (including and excluding individuals who have had sexual intercourse) find no positive effect of the intervention. Third, there is a negative effect of JIC on confidence levels. Past assigned individuals report being less confident in dealing with the challenges of STIs, negotiating safer sex, and using health care services. An index of all five confidence related items finds confidence to be about 6 percent lower among assigned individuals and 4 percent lower among site-level residents at treated sites. Qualitative evidence from focus group discussions highlights that the reduction in confidence was likely due to two unintended side-effects: JIC exposed assigned individuals to knowledge that is in contrast with traditional socio-cultural and religious beliefs, leading to a confusion effect. Moreover, JIC provided information that made assigned individuals acutely aware about the health risks of unprotected sex, leading some to prefer to ignore the topic for fear of social stigma and discrimination rather than to gain clarity about their health status.

Three shortcomings of the evidence used in the paper warrant discussion. First, there are imbalances in the sample of past and future assigned individuals. Such imbalances—perhaps the result of sampling variability—are uncommon in RCTs. The imbalance is particularly surprising given that the study employed a block-randomized design at JIC site-level, which produced high pre-treatment site-level covariate balance. A likely source of individual-level imbalance was the timing of the survey, which was implemented at future sites first, followed by treatment sites. Because of delayed ethical clearance, the surveying activities at treatment sites coincided with Zimbabwe's O-level exams and school holidays. This may explain why respondents in the sample of past assigned individuals are more likely to be in school, younger and less likely to be

unemployed. Most importantly, however, we note that the random site-level sample does not exhibit such imbalance. Indeed, the sample confirms most effects discussed thus far, particularly the effects on the aggregate indexes. A second shortcoming is with regard to the use of survey evidence more broadly. It is well-known that surveys are susceptible to social desirability bias. Yet, the items most likely to suffer from such bias—notably, self-reported behaviour—show no differences across treatment and control sites. On the contrary, the knowledge items, which are less likely to be affected given that they mostly required individuals to explicitly mention answers, exhibit a strong positive effect. The negative effect of JIC on confidence is particularly convincing: if social desirability bias were at work, the negative treatment effect should be even more pronounced. Finally, the timing of the survey—merely one month after the final JIC at treatment sites had been implemented—may have made treatment effects on self-reported behaviour unlikely. While it is true that one month is a short time period to trace behavioural change, we should note that the average time between the survey and treatment was 3.5 months. This time frame should be enough to trace behavioural changes if they, indeed, took place.

More generally, while this study is not a full evaluation of JIC (an intervention implemented in 19 countries across the globe), it does shed sceptical light on the efficacy of BCC interventions. There is widespread evidence that BCC campaigns can increase knowledge. Such an outcome is laudable and confirmed in the present study. However, the ultimate goal of BCC campaigns, to change behaviour, could not be confirmed despite the fact that the intervention set up a direct link to health services and mobile HTC. Given the significant financial resources spent on these interventions over recent decades, donors should think carefully when implementing new BCC interventions. Most problematic, however, is the negative effect of the intervention on

confidence to practice safer sex. Since confidence measures are often interpreted as early indicators of behaviour change, the result is particularly disconcerting. Above all, it demonstrates the need to closely tailor BCC interventions to local practices and demands. While most NGOs rely on fine-grained local networks and have profound knowledge of local norms—as do the NGOs that implemented JIC in Zimbabwe—the result thus serves as a reminder to practitioners how difficult it is to change attitudes and norms. Careful planning and additional research are, hence, necessary to better understand the interaction of BCC interventions and local norms in order to improve the efficacy of future BCC interventions. One promising avenue is to implement BCC interventions in concert with local religious authorities so as to best counter the spread of HIV/AIDS.

¹ The JIC was first developed in 1992 as part of a larger BCC campaign called “Don’t give AIDS a Chance” initiated by the German National Center for Health Education (BZgA). It has since been implemented in 19 countries in Sub-Saharan Africa and Asia.

² As Table 9 shows, 75 percent of JIC sites have been treated before.

³ The detailed trainer’s manual and other information on JIC is available from the authors upon request.

⁴ The original list included 59 localities. However, one NGO dropped out of the intervention due to an unforeseen financing issue, which reduced the number of clusters by 10.

⁵ This included three sites where JIC was implemented in a college.

⁶ The randomization code is available from the authors upon request.

⁷ Original plans for a baseline and second endline survey were canceled due to a lack of financing.

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- ⁸ In particular, the research team divided each site into equally sized blocks. In each block, the surveyors randomly determined which path to follow, and then randomly invited youth to participate in the survey.
- ⁹ Note that payment of respondents was required by the Medical Research Council of Zimbabwe upon reviewing the study protocol.
- ¹⁰ We thank an anonymous reviewer for pointing this out.
- ¹¹ Note that the Assigned sample necessarily has a significantly higher share of students given that 48 percent of JIC sites are in schools / colleges. This explains why the imbalance is more pronounced in the Assigned sample.
- ¹² The detailed FGD report, including summary statistics, is available from the authors upon request.
- ¹³ Regarding socio-cultural pressure, one participant stated: *“If I go to the clinic to access condoms, say someone working there is my uncle or relative and see me trying to get condoms, yet I am not yet allowed to be sexually active at my age. They will ask what I want to use the condoms for, and say that they are for elderly people and not young people like me. That is what will make people shy as they will be afraid of being shamed. They will stop me from getting the condoms.”* Regarding religious norms, one participant noted: *“I think it has to do with religion. Others are members of churches that forbid them to go to clinics, yet these condoms are accessed at clinics. Therefore, going to a clinic will be difficult.”*
- ¹⁴ The concern is confirmed by other studies (e.g., Mburu et al. (2014)) that identify fear of HIV stigma as a key obstacle to efficient prevention.
- ¹⁵ Regarding the fear of knowing about STIs, one participant stated: *“The fear of knowing pressures one not to go. If you go there and you find yourself infected and the question will be, so what is my next step? Therefore it is better for me to stay quiet without knowing.”* Regarding the fear of disclosing an STI one participant noted: *“If I tell my girlfriend she will go and tell other people and may also break up with me. When she breaks up with she will go and tell other people that her boyfriend is infected. Therefore I would rather keep it to myself.”* These fears are in line with studies on women experiencing pregnancy loss and associated fears (Haws et al. 2010).

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Appendix

Table 7: Descriptive Statistics – Individual-Level Neighborhood Sample

| <i>Percent, unless stated</i> | Min | Max | Sample | | | Treatment | | | Control | | | T-Test | F-Test |
|--|-----|-----|--------|------|------|-----------|------|------|---------|------|------|---------|---------|
| | | | N | Mean | SD | N | Mean | SD | N | Mean | SD | P-Value | P-Value |
| <i>Pre-treatment</i> | | | | | | | | | | | | | |
| Age (#) | 15 | 30 | 239 | 19.8 | 2.7 | 121 | 19.6 | 2.7 | 118 | 20.1 | 2.7 | 0.199 | 0.988 |
| Female | 0 | 100 | 239 | 47.3 | 50.0 | 121 | 52.9 | 50.1 | 118 | 41.5 | 49.5 | 0.079 | 0.890 |
| Education scale (1-5) | 1 | 6 | 238 | 3.9 | 0.5 | 121 | 3.9 | 0.5 | 117 | 3.9 | 0.5 | 0.960 | 0.957 |
| Unemployed | 0 | 100 | 239 | 41.0 | 49.3 | 121 | 40.5 | 49.3 | 118 | 41.5 | 49.5 | 0.872 | 0.965 |
| Student (School) | 0 | 100 | 239 | 2.9 | 16.9 | 121 | 0.8 | 9.1 | 118 | 5.1 | 22.1 | 0.054 | 0.000 |
| Student (College) | 0 | 100 | 239 | 30.1 | 46.0 | 121 | 31.4 | 46.6 | 118 | 28.8 | 45.5 | 0.664 | 0.792 |
| Self-Employed | 0 | 100 | 239 | 10.5 | 30.7 | 121 | 10.7 | 31.1 | 118 | 10.2 | 30.4 | 0.885 | 0.794 |
| Catholic | 0 | 100 | 239 | 4.2 | 20.1 | 121 | 4.1 | 20.0 | 118 | 4.2 | 20.2 | 0.968 | 0.895 |
| Apostolic | 0 | 100 | 239 | 45.6 | 49.9 | 121 | 38.8 | 48.9 | 118 | 52.5 | 50.1 | 0.034 | 0.791 |
| Christian unspecified | 0 | 100 | 239 | 49.8 | 50.1 | 121 | 57.0 | 49.7 | 118 | 42.4 | 49.6 | 0.023 | 0.986 |
| Income (USD, p/w) | 0 | 800 | 239 | 11.6 | 59.4 | 121 | 12.5 | 40.7 | 118 | 10.6 | 74.0 | 0.808 | 0.000 |
| No income | 0 | 100 | 239 | 72.0 | 45.0 | 121 | 70.2 | 45.9 | 118 | 73.7 | 44.2 | 0.551 | 0.681 |
| <i>Possibly affected by treatment</i> | | | | | | | | | | | | | |
| Single | 0 | 100 | 239 | 38.9 | 48.9 | 121 | 40.5 | 49.3 | 118 | 37.3 | 48.6 | 0.613 | 0.872 |
| Relationship | 0 | 100 | 239 | 33.5 | 47.3 | 121 | 24.0 | 42.9 | 118 | 43.2 | 49.7 | 0.002 | 0.106 |
| Married | 0 | 100 | 239 | 25.9 | 43.9 | 121 | 32.2 | 46.9 | 118 | 19.5 | 39.8 | 0.024 | 0.074 |
| HIV Test | 0 | 100 | 239 | 52.7 | 50.0 | 121 | 45.5 | 50.0 | 118 | 60.2 | 49.2 | 0.023 | 0.855 |
| Result Known | 0 | 100 | 239 | 10.9 | 31.2 | 121 | 7.4 | 26.3 | 118 | 14.4 | 35.3 | 0.086 | 0.002 |
| Sex before JIC | 0 | 100 | 239 | 29.3 | 45.6 | 121 | 24.8 | 43.4 | 118 | 33.9 | 47.5 | 0.123 | 0.318 |

Note: The table reports descriptive statistics of the Neighborhood sample. All individual-level covariates are reported. The final two columns report *p*-values from *t*- and *F*-tests testing for differences in means and variances across the treatment and control group, respectively.

Table 8: Descriptive Statistics – Individual-Level Assigned Sample

| <i>Percent, unless stated</i> | Min | Max | Sample | | | Treatment | | | Control | | | T-Test | F-Test |
|--|-----|-----|--------|------|------|-----------|------|------|---------|------|------|---------|---------|
| | | | N | Mean | SD | N | Mean | SD | N | Mean | SD | P-Value | P-Value |
| <i>Pre-treatment</i> | | | | | | | | | | | | | |
| Age (#) | 15 | 42 | 758 | 18.9 | 3.1 | 379 | 18.8 | 3.5 | 379 | 19.1 | 2.5 | 0.112 | 0.000 |
| Female | 0 | 100 | 758 | 50.1 | 50.0 | 379 | 50.7 | 50.1 | 379 | 49.6 | 50.1 | 0.772 | 0.999 |
| Education scale (1-5) | 1 | 6 | 758 | 3.9 | 0.5 | 379 | 4.0 | 0.5 | 379 | 3.9 | 0.5 | 0.381 | 0.069 |
| Unemployed | 0 | 100 | 758 | 24.0 | 42.7 | 379 | 19.8 | 39.9 | 379 | 28.2 | 45.1 | 0.006 | 0.018 |
| Student (School) | 0 | 100 | 758 | 7.4 | 26.2 | 379 | 7.4 | 26.2 | 379 | 7.4 | 26.2 | 1.000 | 1.000 |
| Student (College) | 0 | 100 | 758 | 55.0 | 49.8 | 379 | 64.9 | 47.8 | 379 | 45.1 | 49.8 | 0.000 | 0.417 |
| Self-Employed | 0 | 100 | 758 | 7.5 | 26.4 | 379 | 5.0 | 21.9 | 379 | 10.0 | 30.1 | 0.009 | 0.000 |
| Catholic | 0 | 100 | 758 | 3.4 | 18.2 | 379 | 3.2 | 17.5 | 379 | 3.7 | 18.9 | 0.690 | 0.149 |
| Apostolic | 0 | 100 | 758 | 40.9 | 49.2 | 379 | 37.5 | 48.5 | 379 | 44.3 | 49.7 | 0.055 | 0.614 |
| Christian unspecified | 0 | 100 | 758 | 55.0 | 49.8 | 379 | 59.1 | 49.2 | 379 | 50.9 | 50.1 | 0.024 | 0.746 |
| Income (USD, p/w) | 0 | 700 | 758 | 4.9 | 31.1 | 379 | 2.3 | 14.4 | 379 | 7.5 | 41.5 | 0.021 | 0.000 |
| No income | 0 | 100 | 758 | 83.5 | 37.1 | 379 | 91.6 | 27.8 | 379 | 75.5 | 43.1 | 0.000 | 0.000 |
| <i>Possibly affected by treatment</i> | | | | | | | | | | | | | |
| Single | 0 | 100 | 758 | 54.2 | 49.9 | 379 | 63.6 | 48.2 | 379 | 44.9 | 49.8 | 0.000 | 0.521 |
| Relationship | 0 | 100 | 758 | 33.1 | 47.1 | 379 | 26.1 | 44.0 | 379 | 40.1 | 49.1 | 0.000 | 0.034 |
| Married | 0 | 100 | 758 | 11.5 | 31.9 | 379 | 9.2 | 29.0 | 379 | 13.7 | 34.5 | 0.053 | 0.001 |
| HIV Test Result Known | 0 | 100 | 758 | 55.3 | 49.8 | 379 | 48.3 | 50.0 | 379 | 62.3 | 48.5 | 0.000 | 0.554 |
| Sex before JIC | 0 | 100 | 758 | 17.3 | 37.8 | 379 | 16.1 | 36.8 | 379 | 18.5 | 38.9 | 0.388 | 0.290 |
| | 0 | 100 | 758 | 18.2 | 38.6 | 379 | 15.3 | 36.0 | 379 | 21.1 | 40.9 | 0.038 | 0.015 |

Note: The table reports descriptive statistics of the Assigned sample. All individual-level covariates are reported. The final two columns report p-values from t- and F-tests testing for differences in means and variances across the treatment and control group, respectively.

Table 9: Descriptive Statistics – Locality-Level

| <i>Percent, unless stated</i> | Min | Max | Sample | | Treatment | | Control | |
|--------------------------------|-----|-----|--------|------|-----------|------|---------|------|
| | | | Mean | SD | Mean | SD | Mean | SD |
| All Sites | | | | | | | | |
| New JIC Site | 0 | 100 | 23.0 | 42.1 | 16.9 | 37.5 | 29.4 | 45.6 |
| In School | 0 | 100 | 41.9 | 49.4 | 42.0 | 49.4 | 41.6 | 49.3 |
| In College | 0 | 100 | 6.3 | 24.3 | 8.4 | 27.8 | 4.2 | 20.1 |
| Outside School | 0 | 100 | 51.8 | 50.0 | 49.6 | 50.1 | 54.1 | 49.9 |
| Old Intensity (#) | 1 | 4 | 1.7 | 0.9 | 1.6 | 0.9 | 1.8 | 0.9 |
| Rival intervention National BC | 0 | 100 | 29.4 | 45.6 | 30.3 | 46.0 | 28.8 | 45.3 |
| Rival intervention other | 0 | 100 | 8.4 | 27.8 | 8.4 | 27.8 | 8.5 | 27.8 |
| Rival intervention none | 0 | 100 | 49.6 | 50.0 | 48.5 | 50.0 | 50.1 | 50.1 |
| Implementor FACT | 0 | 100 | 25.2 | 43.4 | 26.1 | 44.0 | 24.5 | 43.1 |
| Implementor SAYWHAT | 0 | 100 | 14.8 | 35.6 | 16.6 | 37.3 | 12.7 | 33.3 |
| Implementor RUJEKO | 0 | 100 | 60.0 | 49.0 | 57.3 | 49.5 | 62.8 | 48.4 |
| Old type in school | 0 | 100 | 50.5 | 50.0 | 60.3 | 49.0 | 37.9 | 48.6 |
| Partly funded UNICEF | 0 | 100 | 12.6 | 33.2 | 8.4 | 27.8 | 16.9 | 37.5 |
| Ward (#) | 3 | 36 | 21.8 | 10.1 | 22.1 | 11.2 | 21.6 | 8.8 |

Note: The table reports descriptive statistics of all JIC sites (treatment and control) including all locality-level covariates.

Table 10: Descriptive Statistics – Individual-Level Assigned Sample (non-students)

| <i>percent, unless stated</i> | <i>unless stated</i> | Min | Max | Sample | | | Treatment | | | Control | | | T-Test | F-Test |
|--|----------------------|-----|-----|--------|------|------|-----------|------|------|---------|------|------|---------|---------|
| | | | | N | Mean | SD | N | Mean | SD | N | Mean | SD | P-Value | P-Value |
| Assigned sample | | | | | | | | | | | | | | |
| <i>Pre-treatment</i> | | | | | | | | | | | | | | |
| Age (#) | | 15 | 24 | 285 | 19.8 | 2.6 | 105 | 19.8 | 2.7 | 180 | 19.8 | 2.6 | 0.946 | 0.580 |
| Female | | 0 | 1 | 285 | 47.7 | 50.0 | 105 | 45.7 | 50.1 | 180 | 48.9 | 50.1 | 0.606 | 0.999 |
| Education (1-5) | scale | 1 | 5 | 285 | 3.8 | 0.5 | 105 | 3.9 | 0.7 | 180 | 3.8 | 0.4 | 0.683 | 0.000 |
| Unemployed | | 0 | 1 | 285 | 63.9 | 48.1 | 105 | 71.4 | 45.4 | 180 | 59.4 | 49.2 | 0.038 | 0.364 |
| Student (School) | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Student (College) | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Self-Employed | | 0 | 1 | 285 | 20.0 | 40.1 | 105 | 18.1 | 38.7 | 180 | 21.1 | 40.9 | 0.535 | 0.531 |
| Catholic | | 0 | 1 | 285 | 3.2 | 17.5 | 105 | 0.0 | 0.0 | 180 | 5.0 | 21.9 | 0.002 | 0.000 |
| Apostolic | | 0 | 1 | 285 | 53.0 | 50.0 | 105 | 59 | 49.4 | 180 | 49.4 | 50.1 | 0.117 | 0.880 |
| Christian unspecified | | 0 | 1 | 285 | 42.8 | 49.6 | 105 | 40.0 | 49.2 | 180 | 44.4 | 49.8 | 0.465 | 0.901 |
| Income (USD, p/w) | | 0 | 700 | 285 | 11.9 | 48.5 | 105 | 6.2 | 18.5 | 180 | 15.2 | 59.2 | 0.063 | 0.000 |
| No income | | 0 | 1 | 285 | 62.1 | 48.6 | 105 | 71.4 | 45.4 | 180 | 56.7 | 49.7 | 0.011 | 0.312 |
| <i>Possibly affected by treatment</i> | | | | | | | | | | | | | | |
| Single | | 0 | 1 | 285 | 35.4 | 47.9 | 105 | 43.8 | 49.9 | 180 | 30.6 | 46.2 | 0.027 | 0.371 |
| Relationship | | 0 | 1 | 285 | 36.5 | 48.2 | 105 | 29.5 | 45.8 | 180 | 40.6 | 49.2 | 0.058 | 0.424 |
| Married | | 0 | 1 | 285 | 26.0 | 43.9 | 105 | 25.7 | 43.9 | 180 | 26.1 | 44.0 | 0.941 | 0.985 |
| Tested before JIC | | 0 | 1 | 285 | 54.7 | 49.9 | 105 | 47.6 | 50.2 | 180 | 58.9 | 49.3 | 0.067 | 0.834 |
| Knows result | | 0 | 1 | 285 | 17.5 | 38.1 | 105 | 13.3 | 34.2 | 180 | 20.0 | 40.1 | 0.138 | 0.073 |
| Sex before JIC | | 0 | 1 | 285 | 35.1 | 47.8 | 105 | 33.3 | 47.4 | 180 | 36.1 | 48.2 | 0.636 | 0.860 |

Note: The table reports descriptive statistics of the Assigned sample restricted to non-students. All individual-level covariates are reported. The final two columns report p-values from t- and F-tests testing for differences in means and variances across the treatment and control group, respectively.

Table 11: Descriptive statistics of outcome variables

| <i>percent, unless stated</i> | Sample | | | Treatment | | | Control | | |
|--|---------------|------|------|------------------|------|------|----------------|------|------|
| | N | Mean | SD | N | Mean | SD | N | Mean | SD |
| <i>Knowledge</i> | | | | | | | | | |
| Heard about FP | 997 | 86.0 | 34.8 | 500 | 93.2 | 25.2 | 497 | 78.7 | 41.0 |
| No of FP methods respondent knows (#) | 997 | 2.9 | 2.0 | 500 | 3.4 | 2.0 | 497 | 2.4 | 1.9 |
| Number of sources to get contraceptives respondent knows (#) | 997 | 1.2 | 0.8 | 500 | 1.2 | 0.7 | 497 | 1.2 | 0.9 |
| Heard about condoms | 997 | 93.1 | 25.4 | 500 | 97.0 | 17.1 | 497 | 89.1 | 31.2 |
| No of condom advantages respondent knows (#) | 997 | 1.4 | 0.7 | 500 | 1.5 | 0.7 | 497 | 1.3 | 0.8 |
| Knows how to use condom | 997 | 2.2 | 1.0 | 500 | 2.4 | 1.0 | 497 | 2.1 | 1.0 |
| Heard of STIs | 997 | 81.4 | 38.9 | 500 | 89.2 | 31.1 | 497 | 73.6 | 44.1 |
| No of STIs respondent knows (#) | 997 | 3.5 | 2.2 | 500 | 3.9 | 2.0 | 497 | 3.1 | 2.4 |
| No of STI symptoms respondent knows (#) | 997 | 1.8 | 1.5 | 500 | 2.1 | 1.6 | 497 | 1.5 | 1.5 |
| No of help sources for STIs respondent knows (#) | 997 | 0.9 | 0.5 | 500 | 1.0 | 0.5 | 497 | 0.8 | 0.6 |
| Heard of HIV | 997 | 97.4 | 15.9 | 500 | 98.4 | 12.6 | 497 | 96.4 | 18.7 |
| No of transmission ways respondent knows (#) | 997 | 2.1 | 1.0 | 500 | 2.2 | 1.0 | 497 | 1.9 | 0.9 |
| No of avoidance mechanisms respondent knows (#) | 997 | 2.1 | 1.1 | 500 | 2.3 | 1.1 | 497 | 1.9 | 1.1 |
| Respondent knows where to get tested | 997 | 94.8 | 22.2 | 500 | 96.2 | 19.1 | 497 | 93.4 | 24.9 |
| Perceived to be at risk | 997 | 17.9 | 38.3 | 500 | 15.2 | 35.9 | 497 | 20.5 | 40.4 |
| <i>Behavior</i> | | | | | | | | | |
| Visited health facility last year | 997 | 24.1 | 42.8 | 500 | 24.8 | 43.2 | 497 | 23.3 | 42.3 |
| Visited youth-friendly corner in last 6 months | 997 | 8.4 | 27.8 | 500 | 10.8 | 31.1 | 497 | 6.0 | 23.8 |
| Currently uses FP | 309 | 57.9 | 49.4 | 133 | 62.4 | 48.6 | 176 | 54.5 | 49.9 |
| Used condom last time during sex | 309 | 48.2 | 50.0 | 133 | 42.9 | 49.7 | 176 | 52.3 | 50.1 |
| Uses condoms consistently | 309 | 35.9 | 48.1 | 133 | 30.8 | 46.4 | 176 | 39.8 | 49.1 |
| Has had sex | 997 | 31.0 | 46.3 | 500 | 26.6 | 44.2 | 497 | 35.4 | 47.9 |
| No of sex partners last 12m (#) | 309 | 1.3 | 1.7 | 133 | 1.0 | 0.6 | 176 | 1.6 | 2.2 |
| Has a steady partner | 309 | 70.6 | 45.7 | 133 | 78.2 | 41.4 | 176 | 64.8 | 47.9 |
| Has been tested for HIV | 997 | 64.5 | 47.9 | 500 | 70.2 | 45.8 | 497 | 58.8 | 49.3 |
| Knows their result | 619 | 96.9 | 17.3 | 337 | 96.4 | 18.6 | 282 | 97.5 | 15.6 |
| No of people to talk about personal problems (#) | 993 | 2.7 | 3.4 | 497 | 2.8 | 4.1 | 496 | 2.7 | 2.3 |
| No of people to talk about STIs (#) | 997 | 1.9 | 1.6 | 500 | 2.1 | 1.8 | 497 | 1.7 | 1.3 |
| <i>Confidence</i> | | | | | | | | | |
| Confident to visit health clinic (1-5) | 997 | 2.2 | 1.6 | 500 | 2.1 | 1.5 | 497 | 2.3 | 1.6 |
| Confident to insist on condom (1-5) | 997 | 2.5 | 1.6 | 500 | 2.3 | 1.5 | 497 | 2.7 | 1.6 |
| Confident to refuse sex if no condom is used (1-5) | 997 | 1.9 | 1.3 | 500 | 1.7 | 1.2 | 497 | 2.0 | 1.4 |
| Confident to get STI screening at health facility (1-5) | 997 | 1.5 | 0.9 | 500 | 1.4 | 0.9 | 497 | 1.5 | 1.0 |
| Confident to tell partner about STI (1-5) | 997 | 1.9 | 1.4 | 500 | 1.8 | 1.3 | 497 | 2.0 | 1.5 |

Table 12: Effect of JIC on knowledge without covariates adjustment

| | Family Planning (FP) | | | Condoms | | | Sexually Transmitted Infections (STIs) | | | | HIV | | | Index | | |
|----------------------------|----------------------|---------------------------------------|--|---------------------|--|-------------------------|--|---------------------------------|---|--|-------------------------------|--|---|--------------------------------------|-------------------------|-------------------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| | Heard about FP | Number of FP methods respondent knows | Number of sources to get contraceptives respondent knows | Heard about condoms | Number of condom advantages respondent knows | Knows how to use condom | Heard of STIs | Number of STIs respondent knows | Number of STI symptoms respondent knows | Number of help sources for STIs respondent knows | Heard of HIV | Number of transmission ways respondent knows | Number of avoidance mechanisms respondent knows | Respondent knows where to get tested | Perceived to be at risk | Index |
| Range: | 0-1 | 1-11 | 1-7 | 0-1 | 1-9 | 1-4 | 0-1 | 1-11 | 1-7 | 1-10 | 0-1 | 1-6 | 1-6 | 0-1 | 0-1 | 0-3 |
| Assigned Sample | | | | | | | | | | | | | | | | |
| Treatment | 0.177*** (0.033) | 1.024*** (0.250) | 0.092 (0.101) | 0.084*** (0.023) | 0.198* (0.082) | 0.462*** (0.111) | 0.177*** (0.041) | 0.937** (0.320) | 0.702** (0.209) | 0.169** (0.058) | 0.011 (0.012) | 0.383** (0.117) | 0.420** (0.132) | 0.018 (0.019) | -0.055 (0.038) | 0.309*** (0.078) |
| N | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 |
| Neighborhood Sample | | | | | | | | | | | | | | | | |
| Treatment | 0.046 (0.060) | 0.592 [†] (0.325) | -0.154 (0.126) | 0.061 (0.043) | 0.217 [†] (0.113) | 0.021 (0.148) | 0.089 (0.062) | 0.360 (0.349) | 0.495* (0.223) | 0.113 (0.069) | 0.051 [†] (0.030) | 0.187 (0.133) | 0.237 (0.145) | 0.060 [†] (0.033) | -0.047 (0.053) | 0.173 [†] (0.094) |
| N | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 |

Robust SEs clustered at the site-level in parentheses. [†] p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.

Table 13: Effect of JIC on behavior without covariate adjustment

| | Family Planning | | | Condoms | | Multiple Concurrent Partnerships | | | HIV and access of HTC | | Network Effects | | Index w/o sex | Index w/ sex |
|----------------------------|-----------------------------------|--|-------------------|----------------------------------|---------------------------|----------------------------------|-----------------------------|----------------------|-------------------------|--------------------|--|---------------------------------|-------------------------------|--------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (14) | (15) |
| | Visited health facility last year | Visited youth-friendly corner in last 6 months | Currently uses FP | Used condom last time during sex | Uses condoms consistently | Has had sex | No of sex partners last 12m | Has a steady partner | Has been tested for HIV | Knows their result | No of people to talk about personal problems | No of people to talk about STIs | | |
| Range: | 0-1 | 0-1 | 0-1 | 0-1 | 0-1 | 0-1 | 1-15 | 0-1 | 0-1 | 0-1 | 0-100 | 0-100 | 0-1 | 0-1 |
| Assigned Sample | | | | | | | | | | | | | | |
| Treatment | -0.008 (0.054) | 0.050 (0.037) | 0.119 (0.074) | 0.004 (0.085) | 0.018 (0.098) | -0.121 [†] (0.072) | -0.560** (0.176) | 0.099 (0.067) | 0.124* (0.050) | -0.019 (0.016) | 0.187 (0.261) | 0.433** (0.151) | 0.165*** (0.042) | 0.147** (0.047) |
| N | 758 | 758 | 204 | 204 | 204 | 758 | 204 | 204 | 758 | 478 | 755 | 758 | 755 | 204 |
| Neighborhood Sample | | | | | | | | | | | | | | |
| Treatment | 0.085 (0.058) | 0.040 (0.032) | 0.026 (0.095) | -0.232* (0.106) | -0.244** (0.087) | 0.014 (0.082) | -0.649* (0.300) | 0.186* (0.091) | 0.085 (0.059) | 0.017 (0.024) | -0.154 (0.326) | 0.306 (0.220) | 0.101 [†] (0.050) | 0.039 (0.041) |
| N | 239 | 239 | 105 | 105 | 105 | 239 | 105 | 105 | 239 | 141 | 238 | 239 | 238 | 105 |

Note: Robust SEs clustered at the site-level in parentheses. [†] p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.

Table 14: Effect of JIC on confidence without covariate adjustment

| | Family Planning (FP) | Condoms | | Sexually Transmitted Infections (STIs) | | Index |
|----------------------------|--|--|--|---|--|---------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Confident to visit health clinic | Confident to insist on condom | Confident to refuse sex if no condom is used | Confident to get STI screening at health facility | Confident to tell partner about STI | |
| Range: | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 |
| Assigned Sample | | | | | | |
| Treatment | -0.158 (0.194) | -0.557*** (0.142) | -0.385** (0.127) | -0.029 (0.115) | -0.195 [†] (0.109) | -0.186** (0.061) |
| N | 758 | 758 | 758 | 758 | 758 | 758 |
| Neighborhood Sample | | | | | | |
| Treatment | -0.152 (0.225) | 0.013 (0.231) | -0.066 (0.176) | -0.196 (0.151) | -0.373 [†] (0.194) | -0.123 (0.087) |
| N | 239 | 239 | 239 | 239 | 239 | 239 |

Robust SEs clustered at the site-level in parentheses. [†] p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.

Table 15: Effect of JIC on knowledge with alternative covariate adjustment

| | Family Planning (FP) | | | Condoms | | | Sexually Transmitted Infections (STIs) | | | | HIV | | | Index | | |
|----------------------------|----------------------|---------------------------------------|--|-------------------------------|--|-------------------------|--|---------------------------------|---|--|-------------------|--|---|--------------------------------------|-------------------------|---------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| | Heard about FP | Number of FP methods respondent knows | Number of sources to get contraceptives respondent knows | Heard about condoms | Number of condom advantages respondent knows | Knows how to use condom | Heard of STIs | Number of STIs respondent knows | Number of STI symptoms respondent knows | Number of help sources for STIs respondent knows | Heard of HIV | Number of transmission ways respondent knows | Number of avoidance mechanisms respondent knows | Respondent knows where to get tested | Perceived to be at risk | Index |
| Range: | 0-1 | 1-11 | 1-7 | 0-1 | 1-9 | 1-4 | 0-1 | 1-11 | 1-7 | 1-10 | 0-1 | 1-6 | 1-6 | 0-1 | 0-1 | 0-3 |
| Assigned Sample | | | | | | | | | | | | | | | | |
| Treatment | 0.193*** (0.040) | 1.096*** (0.208) | 0.096 (0.075) | 0.092*** (0.025) | 0.192* (0.073) | 0.502*** (0.070) | 0.190*** (0.042) | 0.825** (0.245) | 0.755*** (0.185) | 0.185** (0.058) | 0.007 (0.013) | 0.418*** (0.097) | 0.424*** (0.110) | 0.026 (0.018) | -0.020 (0.032) | 0.332*** (0.069) |
| N | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 | 758 |
| Neighborhood Sample | | | | | | | | | | | | | | | | |
| Treatment | 0.038 (0.046) | 0.546* (0.236) | -0.166 ⁺ (0.097) | 0.072 ⁺ (0.038) | 0.199* (0.083) | 0.109 (0.121) | 0.078 (0.053) | 0.169 (0.249) | 0.439* (0.193) | 0.099 (0.066) | 0.056* (0.028) | 0.255* (0.109) | 0.340* (0.127) | 0.058* (0.028) | -0.070 (0.052) | 0.172* (0.066) |
| N | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 | 239 |

Note: Robust SEs clustered at the site-level in parentheses. ⁺ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. All site-level and individual-level covariates not labeled “possibly affected by treatment” included (see Table 7 and 9)

Table 16: Effect of JIC on behavior with alternative covariate adjustment

| | Family Planning | | | Condoms | | Multiple Current Partnerships | | | HIV and access of HTC | | Network Effects | | Index w/o sex | Index w/sex |
|----------------------------|-----------------------------------|--|-------------------|----------------------------------|---------------------------|-------------------------------|-----------------------------|----------------------|-------------------------|--------------------|--|---------------------------------|---------------|--------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) |
| | Visited health facility last year | Visited youth-friendly corner in the last 6 months | Currently uses FP | Used condom last time during sex | Uses condoms consistently | Has had sex | No of sex partners last 12m | Has a steady partner | Has been tested for HIV | Knows their result | No of people to talk about personal problems | No of people to talk about STIs | | |
| Range: | 0-1 | 0-1 | 0-1 | 0-1 | 0-1 | 0-1 | 1-15 | 0-1 | 0-1 | 0-1 | 0-100 | 0-100 | 0-1 | 0-1 |
| Assigned Sample | | | | | | | | | | | | | | |
| Treatment | 0.060 | 0.034 | 0.086 | -0.037 | -0.025 | -0.012 | -0.536** | 0.080 | 0.161*** | -0.005 | 0.063 | 0.550*** | 0.161*** | 0.119 ⁺ |
| | (0.043) | (0.034) | (0.076) | (0.094) | (0.081) | (0.041) | (0.169) | (0.057) | (0.036) | (0.018) | (0.209) | (0.143) | (0.035) | (0.063) |
| N | 758 | 758 | 204 | 204 | 204 | 758 | 204 | 204 | 758 | 478 | 755 | 758 | 755 | 204 |
| Neighborhood Sample | | | | | | | | | | | | | | |
| Treatment | 0.091 | 0.024 | -0.120 | -0.107 | -0.164* | -0.003 | -0.494 ⁺ | 0.206* | 0.077 | 0.012 | 0.210 | 0.381 ⁺ | 0.122** | 0.008 |
| | (0.055) | (0.028) | (0.116) | (0.095) | (0.076) | (0.068) | (0.288) | (0.078) | (0.047) | (0.022) | (0.215) | (0.207) | (0.043) | (0.056) |
| N | 239 | 239 | 105 | 105 | 105 | 239 | 105 | 105 | 239 | 141 | 238 | 239 | 238 | 105 |

Note: Robust SEs clustered at the site-level in parentheses. ⁺ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. All site-level and individual-level covariates not labeled “possibly affected by treatment” included (see Table 7 and 9)

Table 17: Effect of JIC on confidence with alternative covariate adjustment

| | Family Planning (FP) | Condoms | | Sexually Transmitted Infections (STIs) | | Index |
|----------------------------|-------------------------------------|-------------------------------------|--|---|--|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Confident to visit health clinic | Confident to insist on condom | Confident to refuse sex if no condom is used | Confident to get STI screening at health facility | Confident to tell partner about STI | |
| Range | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 |
| Assigned Sample | | | | | | |
| Treatment | -0.271 ⁺ (0.143) | -0.526*** (0.140) | -0.373** (0.131) | -0.052 (0.090) | -0.273** (0.097) | -0.211*** (0.053) |
| N | 758 | 758 | 758 | 758 | 758 | 758 |
| Neighborhood Sample | | | | | | |
| Treatment | -0.267 (0.195) | -0.100 (0.219) | -0.108 (0.152) | -0.211 (0.133) | -0.395* (0.164) | -0.165* (0.076) |
| N | 239 | 239 | 239 | 239 | 239 | 239 |

Note: Robust SEs clustered at the site-level in parentheses. ⁺p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. All site-level and individual-level covariates not labeled. “Possibly affected by treatment” included (see Table 7 and 9)

Table 18: Robustness check of count data regression

| No of sex partners last 12m | | | |
|------------------------------------|---------------------|-------------------------------|-------------------------------|
| | (1) | (2) | (3) |
| | OLS | Negative Binomial | Poisson Regression |
| Range: | 1-15 | 1-15 | 1-15 |
| Assigned Sample | | | |
| Treatment | -0.487** (0.152) | -0.387*** (0.101) | -0.389*** (0.105) |
| Above 19 | 0.390 (0.284) | 0.312 [†] (0.181) | 0.316 [†] (0.187) |
| Female | -0.221 (0.172) | -0.222* (0.104) | -0.222* (0.104) |
| N | 204 | 204 | 204 |
| Neighborhood Sample | | | |
| Treatment | -0.139 (0.287) | -0.006 (0.146) | -0.006 (0.146) |
| Above 19 | -0.272 (0.478) | -0.180 (0.156) | -0.180 (0.156) |
| Female | -0.265 (0.204) | -0.198* (0.099) | -0.198* (0.099) |
| N | 104 | 104 | 104 |

Note: Robust SEs clustered at the site-level in parentheses. [†] p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. In addition to reported covariates, models include all individual- and community-level control variables listed in Table 7 – 10. OLS column is identical to the one in Table 5.